Effects of Bunch Thinning on Yield and Fruit Quality of Khalas Date Palm Cultivar

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Abstract: Khalas date palm cultivar grown at the Agriculture Research and Experimental Station, Dirab, College of Food and Agricultural Sciences, King Saud University, Riyadh was thinned by removing 15 and 30% of the total number of strands from the center of each bunch. In general, the average yield per palm and per bunch for the different treatments was lower than the control treatment (non-thinning). Thinning treatments improved both physical and chemical characteristics of fruits (at Benser and Tamur stages), where they significantly increased fruit weight, flesh weight, fruit size, fruit length, fruit diameter, first grade of fruit percent, total soluble solids, reducing sugars, non-reducing sugar, total sugar and fruit moisture content than those of the control treatment. Removing 30% of the total number of strands from the center of each bunch, four weeks after pollination produced the highest fruit quality and could be considered as a recommended treatment in such experiment.

Key words: Date palm · Thinning · Bunch yield · Physical and chemical characters

INTRODUCTION

Date palm *(Phoenix dactylifera* L.) is one of the important fruit species grown in Kingdom of Saudi Arabia. Khalas is one of the best soft types date palm cultivars. It can grow well under drastic environmental conditions which may be not suitable for other fruit species. Successful orchard management practices include appropriate fruit thinning give the remaining fruits a better chance to reach larger size and better quality. Alternate bearing with high and low yields is common in date palms. Fruit thinning is one of major practices that often help to overcome this problem. In addition, it gives better quality and reduces compactness among fruits within bunch. It also helps to give a good flowering in the following year [1-4]. Such results could be attained either by reducing the number or fruits per bunch or by reducing the number of bunches per palm. Hasam et al. [5] found that there was an inverse relation between the number of bunches and each of volume and weight of both fruit and seed. However, the total yield of the palm showed a non linear relationship with the number of bunches. Thinning treatments improved most physical and chemical properties of fruits [6, 7]. Al-Obeed et al. [8] found that the 15% shortening of strands at pollination time led to obtain a reasonable yield with fruit quality.

Removing 15% of total number of Haiany and Halawy bunches strands by either thinning out or cutting back before pollination was benefice to regulate the yield with enhancing the maturity and quality of dates [9]. Belseresht et al. [10] reported that the thinning in chimiri stage had no significant effects on fruit quality and quantity when compared with that at pollination stage. Although removal of one third (control and strand-tip) of strands reduced yield, this treatment increased fruits in top grades.

MATERIALS AND METHODS

The present investigation was carried out in two successive years, 2007 and 2008 at Research and Agriculture Experimental Station at Dirab, College of Food and Agricultural Sciences, King Saud University, Riyadh. Five of 10-years-old date palms grown on sandy soil were selected. The experimental palms were healthy, uniform in growth, vigor and height. Pollination was achieved by using pollen grains from the same parent in both seasons. All cultural practices were carried out according to the normal schedule for experimental palms. Only 10 bunches were left on each experimental tree. Thinning treatments were applied 30 days after hand pollination in both seasons as follows: control (unthinning), removing 15 and
30% of the total number of strands from the center of each bunch. Experimental treatments were arranged in randomized complete block statistical design with five replications (one palm tree for each replication). The yield of experimental trees was harvested through the first half of August. Average bunch weight in kg/palm was recorded. Samples of 10 date fruits were picked at random for the determination of both fruit physical and chemical characteristics.

**Average Bunch Yield Was Estimated by Kg.**

**Fruit Physical Characters:** Samples of five replicates, each 10 fruits were taken randomly from each bunch to determine fruit size and dimensions (length and diameter, in cm), fruit weight, fruit flesh weight and seed weight (in grams).

**Chemical Properties:** Chemical properties of fruits (moisture content, total soluble solid TSS), fruit acidity and sugar content (reducing, non-reducing and total sugar) were determined according to A.O.A.C. [11].

**Statistical Analysis:** All collected data were subjected to statistical analysis according to the procedures reported by Snedecor and Cochran [12]. Means were compared by the Least Significant Difference test (L.S.D.) at the 5% level of probability in the two seasons of experiment.

### RESULTS AND DISCUSSION

**Bunch Yield (kg):** Data presented in Table 1 show the average bunch weight of Khalas date palm cultivar. Fruit thinning of Khalas palm significantly decreased bunch yield than the control treatment in both seasons. Meanwhile, the reduction in bunch yield was increased by increasing the thinning percent. Nevertheless, differences between various degrees of thinning were too small to reach the significant level. These results are in agreement with those obtained by Hussein [1], Mustafa et al. [2], El-Shazly [7], Miremadi [13], Mustafa [14] Osman and Soliman [15] on several date cultivars, since removal part of strands led to a less bunch weight.

**Fruit Characteristics**

**Physical Properties**

**Fruit Weight (g):** Data indicated that all treatments of thinning significantly increased the average fruit weight of Khalas date palm cultivar as compared to that of the control (at Beser and Tantur stages) in both seasons (Tables 1 and 2). The increase in average fruit weight which achieved by thinning may be due to the reduction in fruits compactness which prevents their accumulation within bunch. Consequently, such fruits take the opportunity of natural growth. Comparing the effect of thinning treatments on fruit weight, it was found that

<table>
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<th>Bunch yield (Kg)</th>
<th>Fruit weight (g)</th>
<th>Seed weight (g)</th>
<th>Flesh weight (g)</th>
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removing 30% of the total strands from the bunch center significantly increased the average fruit weight than other thinning treatments in both seasons. The obtained results are similar to those obtained by Mustafa et al. [2], Khalifa et al. [3], AL-Obeed et al. [8], Mustafa [14], Osman and Soliman [15] and Hassaballa et al. [16], they all reported that fruit thinning increased the fruit weight of date palm.

**Seed Weight (g):** Data in Tables 1 and 2 indicated that the seed weight was not significantly affected by thinning treatments for Khales cultivar (at Beser and Tamur stages) in both seasons. These findings are in partial agreement with those obtained by El-Shazly [7].

**Flesh Weight (g):** Data presented in Table 1 indicated that all thinning treatments significantly increased fruit flesh weight (at Beser and Tamur stages) than the control in both seasons. Meanwhile, trees which were thinned by removing 30% of the total strands from the bunch center showed the highest pulp weight of fruits as compared to removing 15% of the total strands from the bunch center. The results are in line with those obtained by Mustafa et al. [2], Khalifa et al. [3], AL-Obeed et al. [8], Mustafa [14], Osman and Soliman [15] and Hassaballa et al. [16].

**Fruit Size (cm³):** Concerning the fruit size, data in Tables 1 and 2 indicated that a significant difference in both seasons. Removing 30% of the total strands from the bunch center gave the highest fruit size (at Beser and Tamur stages) as compared to the control and other studied treatment in both seasons. These results are in agreement with those obtained by AL-Obeed et al. [8], Mustafa [14] and Osman and Soliman [15].

**Fruit Dimensions:** Data of fruit dimensions (length and diameter) for Khales cultivar during the beser stage in both seasons showed that fruit length and diameter were increased significantly by increasing thinning degree (Table 2). Data also indicated that trees thinned by 30% produced the significantly maximum increase in average fruit length and diameter in both seasons. Similar effects of fruit thinning on fruit dimensions (length and diameter) on several date cultivars were reported by Hussein [1], Khalifa et al. [3], AL-Obeed et al. [8] Mustafa [14], Osman and Soliman [15] and Hussein et al. [17].

**First and Second of Fruit Grade:** Concerning the fruit grading, thinning treatments produced a higher percent of first grade fruit than unthinned treatment (control). Moreover, removing 30% of strands/bunch resulted in the highest percent of first grade fruits compared to 15 % and control treatment (56.98 and 61.57, 49.44 and 49.35 and 42.87 and 42.63%) in the first and second seasons, respectively (Table 2). Meanwhile, more second grade fruits were shown in the control followed by 15 % and 30 % of thinning treatments (57.12 and 57.37, 50.56 and 50.64 and 43.02 and 38.43) in both seasons, respectively.

**Chemical Properties**

**Total Acidity (%):** Regarding the investigated treatments, fruit acidity percentage was not influenced significantly by thinning treatments in the two seasons (Table 3). These results are in agreement with those reported El-Shazly [7] on Nabet Ali cultivar and Osman and Soliman [15] on Sakkoty, Shama and Balady dates.

**Total Soluble Solids (%):** Data in Table 3 indicated that different thinning treatments increased TSS% in fruit than the control in both seasons. The most effective treatment in such concern was thinning of 30% of the total number strands. In general, these results are in agreement with the findings of El-Shazly [7], AL-Obeed et al. [8] and Osman and Soliman [15].
Reducing Sugars (%): Concerning the effect of thinning treatments on reducing sugars, data presented in Table 3 indicated that removing 30% of the total strands from the bunch center gave the highest reducing sugars (at Tamur stage) as compared to the control and the other studied treatment in both seasons. These results are in general agreement with those obtained by El-Kassas [18], Khalifa et al.[3], Sayed [19] on Zaghloul dates, El-Shazly [7] on Nabtet Ali dates, Osman and Soliman[15] on Sakkoti, Shamiya and Balady dates and Al-Obeed et al. [8] on Sucuary dates. They reported that thinning treatments increased reducing sugars.

Non-reducing Sugars (%): The obtained data indicated that, the non-reducing sugars percentage shows similar trend as reducing sugars. The non-reducing sugars were increased significantly by removing 30% of the total strands from the bunch center (Tamu stage) than the control and the other studied treatment (Table 3). These results are in agreement with those reported by Al-Obeed et al. [8] and Osman and Soliman [15].

Total Sugars (%): Values of total sugars % followed a trend similar to that of total soluble solids percent in both seasons. Thinning 30% of the total number of strands significantly increased total sugars percent (Tamu stage) than the control and thinning 15% treatment (Table 3). In general, these findings concern the response of Khasas fruit chemical characteristics to the different treatments of fruit thinning goes in line with those reported by Khalifa et al.[3], El-Kassas [18] and Sayed [19], they mentioned that fruit thinning increased total sugars of Zaghloul dates. In addition, Hussein et al. [20] reported that fruit sugar contents of Samani dates significantly increased by fruit thinning. Similar results were reported by Mustafa [14] on Siwi and El-Shazly [7] on Nabet Ali dates. They found that removing 30% of entire spiculets from bunches center of fruit dates increased the fruit total sugars content. Al-Obeed et al. [8] on Sucuary dates found that the shortening of strands 40% gave the highest value of total sugars.

Moisture Content (%): Regarding the moisture, the results indicated significant differences in both seasons. Since removing 30% of the total strands from the bunch center gave the highest moisture content (Tamur stage) as compared to the control and other studied treatment in both seasons (Table 3). On the contrary, Al-Obeed et al. [8] and Osman and Soliman [15] reported that the moisture content was not significantly affected by thinning treatments or the control which recorded highest values as compared to other thinning treatments.

In conclusion, thinning treatments improved fruit characteristics where they increased significantly fruit physical and chemical properties of dates (at Tamur stage) than the control. Meanwhile, the most beneficial treatment in such concern was thinning 30% of the total number of strands from the center of bunches.

ACKNOWLEDGEMENTS

With sincere respect and gratitude, we would like to express deep thanks to President of Agriculture Research Center, College of Food and Agric. Sciences, King Saud Univ. for his financial support, inspiring guidance, sponsoring, encouragement, counsel, understanding and constructive criticism which have vitally contributed to this study. Also, many thanks for all staff members of Agriculture Research Center for kind advice, help, support and for their continuous energetic encouragement.

REFERENCES


